CofC

PTO/SB/21 (02-04)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	6,748,765 B2 09/851627
Filing Date	June 15, 2004
First Named Inventor	Richard Pitbladdo
Art Unit	
Examiner Name	
Attorney Docket Number	PIT-1

Total Number of Pages in This Submission: 60

ENCLOSURES *(Check all that apply)*

- [x] Fee Transmittal Form
- [x] Fee Attached
- [ ] Amendment/Reply
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Response to Missing Parts/ Incomplete Application
  - [ ] Response to Missing Parts under 37 CFR 1.52 or 1.53
- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert to a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s) _____
- [ ] After Allowance communication to Technology Center (TC)
- [ ] Appeal Communication to Board of Appeals and Interferences
- [ ] Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- [ ] Proprietary Information
- [ ] Status Letter
- [x] Other Enclosure(s) (please Identify below):

Certificate of correction paperwork
Post Card

Remarks

Certificate
AUG 12 2004
of Correction

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Brown & Michaels PC
Signature	Megh M Reg. No. 45,612
Date	8/3/04

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below.

Typed or printed name	Justin Wood		
Signature		Date	8/3/04

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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PTO/SB/17 (10-03)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

FEE TRANSMITTAL for FY 2004

Effective 10/01/2003. Patent fees are subject to annual revision.

☑ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 100.00

Complete if Known	
~~Application~~ Patent Number	6,748,765
~~Filing~~ Issue Date	June 15, 2004
First Named Inventor	Richard Pitbladdo
Examiner Name	
Art Unit	
Attorney Docket No.	PIT-1

METHOD OF PAYMENT *(check all that apply)*

☑ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☑ Deposit Account:

Deposit Account Number: 02-0910

Deposit Account Name: Brown & Michaels, PC

The Director is authorized to: *(check all that apply)*

☐ Charge fee(s) indicated below ☑ Credit any overpayments

☑ Charge any additional fee(s) or any underpayment of fee(s)

☐ Charge fee(s) indicated below, **except for the filing fee** to the above-identified deposit account.

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	770	2001	385	Utility filing fee	
1002	340	2002	170	Design filing fee	
1003	530	2003	265	Plant filing fee	
1004	770	2004	385	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($) 0.00

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

	Extra Claims		Fee from below	Fee Paid
Total Claims		-20** =	X	= 0.00
Independent Claims		- 3** =	X	= 0.00
Multiple Dependent				=

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	86	2201	43	Independent claims in excess of 3
1203	290	2203	145	Multiple dependent claim, if not paid
1204	86	2204	43	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 0.00

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	420	2252	210	Extension for reply within second month	
1253	950	2253	475	Extension for reply within third month	
1254	1,480	2254	740	Extension for reply within fourth month	
1255	2,010	2255	1,005	Extension for reply within fifth month	
1401	330	2401	165	Notice of Appeal	
1402	330	2402	165	Filing a brief in support of an appeal	
1403	290	2403	145	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,330	2453	665	Petition to revive - unintentional	
1501	1,330	2501	665	Utility issue fee (or reissue)	
1502	480	2502	240	Design issue fee	
1503	640	2503	320	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	770	2809	385	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	770	2810	385	For each additional invention to be examined (37 CFR 1.129(b))	
1801	770	2801	385	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) Certificate of correction 100.00

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 100.00

SUBMITTED BY				(Complete *(if applicable)*)	
Name (Print/Type)	Meghan Van Leeuwen	*Registration No. (Attorney/Agent)*	45,612	*Telephone*	(607) 256-2000
Signature				*Date*	8/3/04

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This collection of information is required by 37 CFR 1.17 and 1.27. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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AUG 12 2004

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Number:	6,748,765
Issued:	June 15, 2004
Name of Patentee:	Richard B. Pitbladdo
Title of Invention:	OVERFLOW DOWNDRAW GLASS FORMING METHOD AND APPARATUS

Commissioner of Patents and Trademarks
Washington, DC 20231
Attn: Certificate of Correction Branch

REQUEST FOR CERTIFICATE OF CORRECTION OF PATENT
(37 CFR 1.323)

1. Attached in duplicate is Form PTO/SB/44 with at least one copy being suitable for printing.

2. Attached are copies of the following:

   - Copy of last office action response dated October 22, 2003
   - Copy of the claims of issued patent 6,748,765 (col. 15-24)

3. All of the errors in the patent are of a minor, typographical nature.

4. The exact page and line numbers where errors occur in the application file are:

   Claim 1 (col. 15, line 67): "ton", should read "top"

   Claim 5 (col. 16, line 18): "fanning" should read "forming"

   Claim 10 (col. 16, line 63): "farther" should read "further"

   Claim 11 (col. 17, line 2): "farther" should read "further"

   Claim 18 (col. 17, line 51): "way" should read "may"

   Claim 21 (col. 18, line 5): "glass it" should read "glass as it"

   Claim 40 (col. 19, line 49): "molted" should read "molten"

   Claim 61 (col. 22, line 3): "molted" should read "molten"

   Claim 68 (col. 22, line 36): "beating" should read "heating"

5. Regarding the errors introduced by the patent office in claims 1, 5, 10, 11, 18, and 68, the corrected wording is found in the listing of the claims on pages 4-18 of the office action response dated October 22, 2003.

6. Regarding claims 40 and 61, "molten glass" is used throughout the patent and claims. Molted is merely a typographical error. A copy of the issued claims are attached. Some of the instances of "molten" in the claims have been highlighted.

7. Regarding claim 21, the amended language can be found in issued claim 4 (col. 16, lines 14-16) "heating elements that can be used to differentially heat the molten glass as it is flowing...." The omission of the word as was a clerical error. A copy of claim 4 in the issued patent is attached.

8. Attached is the fee required under 37 C.F.R. 1.20(a).

9. Please send the Certificate to:

Meghan Van Leeuwen
Brown & Michaels, P.C.
400 M&T Bank Building
118 North Tioga Street
Ithaca, New York 14850-4343

By: _____
Meghan Van Leeuwen, Reg. No. 45,612
Agent of Record
Date: 8/3/04

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,748,765 B2

DATED: June 15, 2004

INVENTOR: Richard B. Pitbladdo

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 15

Line 67, replace the word " ton" with the word " top"

Column 16

Line 18, replace the word " fanning" with the word " forming"

Line 63, replace the word " farther" with the word " further"

Column 17

Line 2, replace the word " farther" with the word " further"

Line 51, replace the word " way" with the word " may"

Column 18

Line 5, add the word " as" between the words " glass" and " it"

Column 19

Line 49, replace the word " molted" with the word " molten"

Column 22

Line 3, replace the word " molted" with the word " molten"

Line 36, replace the word " beating" with the word " heating"

MAILING ADDRESS OF SENDER:

PATENT NO. 6,748,765 B2

Brown & Michaels
400 M&T Bank Building
118 North Tioga Street
Ithaca, New York 14850-4343

AUG 12 2004

(PTO FORM PTO/SB/44)

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,748,765 B2

DATED: June 15, 2004

INVENTOR: Richard B. Pitbladdo

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 15

Line 67, replace the word "ton" with the word "top"

Column 16

Line 18, replace the word "fanning" with the word "forming"

Line 63, replace the word "farther" with the word "further"

Column 17

Line 2, replace the word "farther" with the word "further"

Line 51, replace the word "way" with the word "may"

Column 18

Line 5, add the word "as" between the words "glass" and "it"

Column 19

Line 49, replace the word "molted" with the word "molten"

Column 22

Line 3, replace the word "molted" with the word "molten"

Line 36, replace the word "beating" with the word "heating"

MAILING ADDRESS OF SENDER:

Brown & Michaels
400 M&T Bank Building
118 North Tioga Street
Ithaca, New York 14850-4343

PATENT NO. 6,748,765 B2

AUG 12 2004

(PTO FORM PTO/SB/44)

Additional thickness correction may be accomplished by selective heating or cooling of the molten glass (2) in the trough (4) and/or heating the weirs and thus the molten glass (2) flowing over the weirs and/or heating the orifice (20) and thus the molten glass (2) flowing through the orifice. One caveat with this approach is that the molten glass (2) flowing from the root (25) of the apparatus (1) must be of substantially uniform temperature. Therefore, the glass molten (2) would need to be selectively cooled or heated as it flows down the outside of the apparatus in order to produce the required substantially uniform temperature.

FIGS. **24***a*–**24***c* show an embodiment that has a simple trough (4) with sloped weirs (5), radiant top heating devices (42) and radiant side heating devices (44). The top heating devices (42) would be individually powered to either heat or cool the molten glass (2) as it flows through the trough (4). The lowered viscosity of the molten glass caused by a heating strategy would flow substantial molten glass (2) to the far end of the forming apparatus body (1). This heating or cooling effect could be made linear thus effecting the wedge in glass sheet thickness or nonlinear thus effecting the curvature of the glass sheet thickness. The side heating devices would be selectively powered to restore the molten glass (2) to a substantially uniform temperature as it reaches the root (25) of the forming apparatus body (1).

An additional embodiment would be an electrical heating system inserted in the trough. If the two parallel elements of the flow control plug shown in FIGS. **13***a*–**13***c* were constructed as individual isolated electrodes, they may be used as a pair of electrodes for introducing electrical energy through the electrically conductive molten glass (2) from one side to the other side of the trough (4).

Numerous other methods of heating the weirs (5), the orifice (20), and/or the molten glass (3) in the trough (4) are possible. If the weirs (5) are made from molybdenum or are clad with platinum they may be used as a pair of electrodes for firing electrical energy through the electrically conductive molten glass (2) from one side to the other side of the trough (4). If either the weirs (5) or the orifice (20) are clad with platinum they may used as a conductor in an electric circuit to heat the molten glass (2). If either the weirs (5) or the orifice (20) are made from molybdenum or are clad with platinum and the flow control plug (30) is an electrode, an electric circuit may be established to heat the electrically conductive molten glass (2) in the trough (4). All of the above heating techniques would require some type of selectively powered side heating devices (44) to restore the molten glass (2) to a substantially uniform temperature as it reaches the root (25) of the forming apparatus body (1).

Accordingly, it is to be understood that the embodiments of the invention herein described are merely illustrative of the application of the principles of the invention. Reference herein to details of the illustrated embodiments is not intended to limit the scope of the claims, which themselves recite those features regarded as essential to the invention.

What is claimed is:

1. An improved apparatus for forming sheet glass, wherein the apparatus includes a trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, and wherein the improvement comprises:

an overflow device on the trough that allows at least some of the molten glass within the trough to overflow a ton of a far end of the trough without flowing over the downwardly sloping sides of the wedged shaped sheet forming structure.

2. The improved apparatus for forming sheet glass of claim **1** wherein the improvement further comprises the top of the sides of the trough being substantially curved along their length.

3. The improved apparatus for forming sheet glass of claim **1** wherein the improvement further comprises the bottom of the trough being substantially curved or chamfered to reduce areas where the molten glass flows significantly slower than the average molten glass flow rate in the trough.

4. The apparatus for forming sheet glass of claim **1** wherein the improvement further comprises heating elements that can be used to differentially heat the molten glass as it is flowing to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus.

5. An improved apparatus for fanning sheet glass, wherein the apparatus includes a trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, and wherein the improvement comprises:

substantially curved top sides of the trough, wherein a substantial portion of said curved top sides has a convex upward shape, such that a substantially uniform thickness glass sheet is formed when glass flows into the trough and over the sides of the trough.

6. The apparatus for forming sheet glass of claim **5** wherein the improvement further comprises heating elements that can be used to differentially heat the molten glass as it is flowing to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus.

7. The improved apparatus for forming sheet glass of claim **5** wherein the improvement further comprises the bottom of the trough being substantially curved or chamfered to reduce areas where the molten glass flows significantly slower than the average molten glass flow rate in the trough.

8. An improved apparatus for forming sheet glass, wherein the apparatus includes an inflow pipe for delivering molten glass, a trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, and wherein the improvement comprises:

the inflow pipe shaped to modify the way molten glass flows into the trough such that the molten glass has a more uniform time dependent flow throughout the trough relative to how molten glass would flow if it passed through a cylindrical pipe.

9. The improved apparatus for forming sheet glass of claim **8** wherein the improvement further comprises the top of the sides of the trough being substantially curved along their length.

10. The improved apparatus for forming sheet glass of claim **8** wherein the improvement farther comprises the bottom of the trough being substantially curved or chamfered to reduce areas where the molten glass flows significantly slower than the average molten glass flow rate in the trough.

11. The improved apparatus for forming sheet glass of claim 8 wherein the improvement farther comprises heating elements that can be used to differentially heat the molten glass as it is flowing to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus.

12. The improved apparatus for forming sheet glass of claim 8 wherein the improvement further comprises an overflow device on the trough that allows at least some of the molten glass within the trough to overflow the trough without flowing over the downwardly sloping sides of the wedged shaped sheet forming structure.

13. An improved apparatus for forming sheet glass, wherein the apparatus includes a trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of wedge, and wherein the improvement comprises:

a) an internally mounted flow control plug that can be inserted and adjusted within the trough to change at least one flow characteristic of the molten glass within the trough.

14. The improved apparatus for forming sheet glass of claim 13 wherein the improvement further comprises the top of the sides of the trough being substantially curved along their length.

15. The improved apparatus for forming sheet glass of claim 13 wherein the improvement further comprises the bottom of the trough being substantially curved or chamfered to reduce areas where the molten glass flows significantly slower than the average molten glass flow rate in the trough.

16. The improved apparatus for forming sheet glass of claim 13 wherein the improvement further comprises heating elements that can be used to differentially heat the molten glass as it is flowing to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus.

17. The apparatus for forming sheet glass of claim 13 wherein the improvement further comprises an overflow device on the trough that allows at least some of the molten glass within the trough to overflow the trough without flowing over the downwardly sloping sides of the wedged shaped sheet forming structure.

18. The apparatus for forming sheet glass of claim 17, wherein the elements of the trough are held together with a glass seal such that small adjustments in a position of the flow control plug way be made.

19. The apparatus for forming sheet glass of claim 13, wherein the elements of the trough are held together with a glass seal such that small adjustments in a position of the flow control plug may be made.

20. The apparatus for forming sheet glass of claim 13 wherein the improvement further comprises an inflow pipe shaped to modify the way molten glass flows into the trough such that the molten glass has a more uniform time dependent flow throughout the trough relative to how molten glass would flow if it passed through a cylindrical pipe.

21. An improved apparatus for forming sheet glass, wherein the apparatus includes a trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, and wherein the improvement comprises:

heating elements that can be used to differentially heat the molten glass it is flowing to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus, wherein the heating elements heat the molten glass on a top and the sides of the wedged shaped sheet forming structure substantially before the glass from each side of the wedged shaped sheet forming structure meets at the bottom of the wedge.

22. An apparatus for forming sheet glass comprising:

a) an inflow pipe of appropriate structure for conveying molten glass under pressure;

b) a trough having sides and a top attached to the inflow pipe wherein the trough receives the molten glass;

c) an orifice running along the top of the trough such that as molten glass is conveyed to the trough the molten glass exits through the orifice and passes down the sides of the trough; and

d) a wedged shaped sheet forming structure attached to the trough and that has downwardly sloping sides converging at the bottom of the structure to form the wedge shape such that a glass sheet of substantially uniform thickness is formed when molten glass flows down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge.

23. The apparatus for forming sheet glass of claim 22 wherein the orifice is narrow along the top of the trough closest to the inflow pipe and widens for at least a portion of the length of the orifice further away from the inflow pipe such that as the glass loses static pressure as it flows through the trough the widening orifice maintains a uniform flow of glass through the orifice along its length.

24. The apparatus for forming sheet glass of claim 23 further comprising an internally mounted flow control plug that can be inserted and adjusted within the trough to change at least one flow characteristic of the molten glass within the trough.

25. The apparatus for forming sheet glass of claim 24 wherein the elements of the trough are held together with a glass seal such that adjustments in a position of the flow control plug may be made.

26. The apparatus for forming sheet glass of claim 23 wherein the bottom of the trough is curved or chamfered to reduce areas where the molten glass flows significantly slower than the average molten glass flow rate in the trough.

27. The apparatus for forming sheet glass of claim 23 wherein the shape of the inflow pipe modifies the way molten glass flows into the trough such that the molten glass has a more uniform time dependent flow throughout the trough relative to how molten glass would flow if in passed through a cylindrically shape inflow pipe.

28. The apparatus for forming sheet glass of claim 23 further comprising heating elements that can be used to differentially heat the molten glass as it is flowing to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus.

29. The apparatus for forming sheet glass of claim 23 further comprising an orifice in the bottom of the trough that allows melted glass to flow to the bottom of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus.

30. The apparatus for forming sheet glass of claim 29 wherein the elements of the trough are held together with a glass seal such that adjustments in the shape of the trough or orifices may be made.

31. The apparatus for forming sheet glass of claim 23 further comprising two orifices in the side of the trough that allow molten glass to flow to the downwardly sloped sides of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus.

32. The apparatus for forming sheet glass of claim 31 wherein the top of the sides of the trough are substantially curved along their length.

33. The apparatus for forming sheet glass of claim 32 wherein the elements of the trough are held together with a glass seal such that small adjustments in the shape of the trough or orifices may be made.

34. The apparatus for forming sheet glass of claim 22 further comprising an internally mounted flow control plug that can be inserted and adjusted within the trough to change at least one flow characteristic of the molten glass within the trough.

35. The apparatus for forming sheet glass of claim 34 further comprising heating elements that can be used to differentially heat the molten glass as it is flowing to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus.

36. The apparatus for forming sheet glass of claim 34 wherein the elements of the trough are held together with a glass seal such that adjustments in a position of the flow control plug may be made.

37. The apparatus for forming sheet glass of claim 22 wherein the bottom of the trough is curved or chamfered to reduce areas where the molten glass flows significantly slower than the average molten glass flow rate in the trough.

38. The apparatus for forming sheet glass of claim 22 wherein the shape of the inflow pipe modifies the way molten glass flows into the trough such that the molten glass has a more uniform time dependent flow throughout the trough relative to how molten glass would flow if it passed through a cylindrically shape inflow pipe.

39. The apparatus for forming sheet glass of claim 22 further comprising heating elements that can be used to differentially heat the molten glass as it is flowing to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus.

40. The apparatus for forming sheet glass of claim 22 further comprising an orifice in the bottom of the trough that allows molted glass to flow to the bottom of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus.

41. The apparatus for forming sheet glass of claim 40 wherein the elements of the trough are held together with a glass seal such that adjustments in the shape of the trough or orifices may be made.

42. The apparatus for forming sheet glass of claim 40 wherein the top of the sides of the trough being substantially curved along their length.

43. The apparatus for forming sheet glass of claim 22 further comprising two orifices in the side of the trough that allows molten glass to flow to the downwardly sloped sides of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus.

44. The apparatus for funning sheet glass of claim 43 wherein the elements of the trough are held together with a glass seal such that small adjustments in the shape of the trough or orifices may be made.

45. An improved method for forming sheet glass using an apparatus that includes a trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge and forming such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, wherein the improvement comprises:

a) providing an overflow device on the trough;

b) positioning the forming apparatus such that at least some of the molten glass within the trough passes out of a top of a far end of the trough through the overflow device without flowing over the downwardly sloping sides of the wedged shaped sheet forming structure; and

c) flowing molten glass into the trough such that a glass sheet of substantially uniform thickness is formed.

46. The improved method for forming sheet glass of claim 45 wherein the improvement further comprises adjusting both the tilt of the trough and the amount of molten glass passing through the overflow device.

47. An improved method for forming sheet glass using an apparatus that includes a trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge and forming such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, wherein the improvement comprises:

a) providing heating elements that can differentially heat the molten glass as it flows, wherein the heating elements heat the molten class on a top and the sides of the wedged shaped sheet forming structure substantially before the glass from each side of the wedged shaped sheet forming structure meets at the bottom of the wedge; and

b) flowing molten glass into the trough and heating the molten glass differentially to adjust for wedge or curvature irregularities such that a glass sheet of substantially uniform thickness is formed.

48. The improved method for forming sheet glass of claim 47 wherein the improvement further comprises the step of adjusting a tilt of the trough.

49. An improved method for forming sheet glass using an apparatus that includes an inflow pipe for delivering molten glass, a trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, and wherein the improvement comprises:

a) providing the inflow pipe shaped to modify the way molten glass flows into the trough such that the molten glass has a more uniform time dependent flow throughout the trough relative to how molten glass would flow if it passed through a cylindrical pipe; and

b) flowing molten glass into the trough such that a glass sheet of substantially uniform thickness is formed.

50. An improved method for forming sheet glass using an apparatus that includes a trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, and wherein the improvement comprises:

a) providing an internally mounted flow control plug that can be inserted and adjusted within the trough;

b) using the flow control plug to adjust at least one flow characteristic of the molten glass within the trough;

c) flowing molten glass into the trough such that a glass sheet of substantially uniform thickness is formed.

51. The improved method for forming sheet glass of claim 50, wherein the elements of the trough are held together with a glass seal such that small adjustments in a position of the flow control plug may be made.

52. The improved method for forming sheet glass of claim 50, further comprising the step of providing an overflow device on the trough.

53. The improved method for forming sheet glass of claim 52 wherein the elements of the trough are held together with a glass seal such that adjustments in a position of the flow control plug may be made.

54. The improved method for forming sheet glass of claim 52, wherein the improvement further comprises the step of adjusting a tilt of the trough.

55. The improved method for forming sheet glass of claim 50, wherein the improvement further comprises the step of adjusting a tilt of the trough.

56. A method for forming sheet glass comprising:

a) providing an inflow pipe connected to a trough having sides and a top attached to the inflow pipe;

b) providing an orifice running along the top of the trough;

c) providing a wedged shaped sheet forming structure attached to the trough that has downwardly sloping sides converging at the bottom of the structure to form the wedge; and

d) conveying molten glass under pressure through the inflow pipe into the trough such that the molten glass exits through the orifice and flows down the sides of the trough and the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge and forms a glass sheet of substantially uniform thickness.

57. The method for forming sheet glass of claim 56 wherein the orifice is narrow along the top of the trough closest to the inflow pipe and widens for at least a portion of the length of the orifice further away from the inflow pipe such that as the glass loses static pressure as it flows through the trough a uniform flow of glass is maintained along the length of the widening orifice.

58. The method for forming sheet glass of claim 57 further comprising the steps of providing a flow control plug that can be inserted and adjusted within the trough and using the flow control plug to change at least one flow characteristic of the molten glass within the trough.

59. The improved method for forming sheet glass of claim 58, wherein the elements of the trough are held together with a glass seal such that small adjustments in a position of the flow control plug may be made.

60. The method for forming sheet glass claim 57 further comprising the step of heating the molten glass differentially to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus.

61. The method for forming sheet glass claim 57 further comprising the step of providing an orifice in the bottom of the trough that allows molted glass to flow to the bottom of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus.

62. The method for forming sheet glass of claim 61 wherein the elements of the trough are held together with a glass seal such that adjustments in the shape of the trough or orifices may be made.

63. The method for forming sheet glass of claim 57 further comprising the step of providing two orifices in the side of the trough that allow molten glass to flow to the downwardly sloped sides of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus.

64. The method for forming sheet glass of claim 63 wherein the elements of the trough are held together with a glass seal such that small adjustments in the shape of the trough or orifices maybe made.

65. The method for forming sheet glass of claim 57 wherein the improvement further comprises the step of adjusting a tilt of the trough.

66. The method for forming sheet glass of claim 56 further comprising providing a flow control plug that can be inserted and adjusted within the trough and using the flow control plug to change at least one how characteristic of the molten glass within the trough.

67. The improved method for forming sheet glass of claim 66, wherein the elements of the trough are held together with a glass seal such that small adjustments in a position of the flow control plug may be made.

68. The method for forming sheet glass claim 56 further comprising beating the molten glass differentially to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus.

69. The method for forming sheet glass claim 56 further comprising providing an orifice in the bottom of the trough that allows molten glass to flow to the bottom of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus.

70. The method for forming sheet glass of claim 69 wherein the elements of the trough are held together with a glass seal such that adjustments in the shape of the trough or orifices may be made.

71. The method for forming sheet glass of claim 56 further comprising providing two orifices in the side of the trough that allows molten glass to flow to the downwardly sloped sides of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus.

72. The method for forming sheet glass of claim 71 wherein the elements of the trough are held together with a glass seal such that small adjustments in the shape of the trough or orifices may be made.

73. The improved method for forming sheet glass of claim 56 wherein the improvement further comprises the step of adjusting a tilt of the trough.

74. An improved apparatus for forming sheet glass, wherein the apparatus includes a trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides con-

verging at the bottom of the wedge such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, and wherein the improvement comprises:

an orifice in the bottom of the trough that allows molten glass to flow to the bottom of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus and virgin glass forms an outside surface of the glass sheet.

75. The apparatus for forming sheet glass of claim **74** wherein the elements of the trough are held together with a glass seal such that adjustments in the shape of the trough or orifices may be made.

76. An improved apparatus for forming sheet glass, wherein the apparatus includes a trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, and wherein the improvement comprises:

two orifices in the side of the trough that allow molten glass to flow to the downwardly sloped sides of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus and virgin glass forms an outside surface of the glass sheet.

77. The apparatus for forming sheet glass of claim **76** wherein the elements of the trough are held together with a glass seal such that adjustments in the shape of the trough or orifices may be made.

78. The apparatus for forming sheet glass of claim **76**, further comprising an overflow device on the trough that allows at least some of the molten glass within the trough to overflow a top of a far end of the trough without flowing over the downwardly sloping sides of the wedged shaped sheet forming structure.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

October 22, 2003

Serial No.	09/851,627
Applicant:	Richard B. Pitbladdo
Filed:	May 9, 2001
Title:	Sheet Glass Forming Apparatus
Art Unit:	1731
Examiner:	Vincent, Sean E
Confirmation Number:	4080
Attorney Docket No.:	PIT-1

HONORABLE COMMISSIONER OF PATENTS
Washington, D.C. 20231

AMENDMENT

AND RESPONSE TO OFFICE ACTION

In response to the Office Action dated June 23, 2003, please amend the above-identified application as follows:

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Claims are reflected in the listing of claims which begins on page 4 of this paper.

Amendments to the Drawings begin on page 19 of this paper and include attached replacement sheets.

Remarks/Arguments begin on page 20 of this paper.

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited in the U.S. Postal Service as Certified Mail No: 7002 0860 0005 0847 5258 with a return receipt requested, in an envelope addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231 on .

Justin Wood

Amendments to the Specification:

Pursuant to 37 C.F.R. § 1.121(b) kindly amend the specification as follows. Amendments to the specification are made by presenting replacement paragraphs or sections marked up to show changes made relative to the immediate prior version. The changes in any amended paragraph or section are being shown by strikethrough (for deleted matter) or underlined (for added matter).

Please replace the title on page 1, line 1 with the following title:

OVERFLOW DOWNDRAW~~SHEET~~ GLASS FORMING METHOD AND APPARATUS

Please replace the paragraph on page 1, lines 12-13 with the following paragraph at page 1, line 12:

4) Provisional Application Number 60/219,902, filed July 21, 2000, entitled "SHEET GLASS FORMING APPARATUS";

Please replace the paragraph on page 10, lines 10-22, with the following paragraph at page 10, line 10:

The forming apparatus shown in Figures 2a-2d has straight sloped weirs (5) that are close to parallel with the pointed edge of the wedge shaped portion of the forming apparatus (1) but sloped slightly downward in the direction away from the inflow pipe (3). Glass (2) enters the trough (4) through an inflow pipe (3). The bottom and sides of the trough (4) are contoured in a manner to provide even distribution of glass to the top of each side weir (5). The major portion of the glass (2) then flows over the top of each side weir (5), down each side of the wedge shaped portion of the forming apparatus (1), and joins at the bottom of the wedge to form a sheet of molten glass (2). The molten glass (2) is then cooled to form a solid glass sheet of substantially uniform thickness. A small portion of the glass (22) passes through the forming trough (4) and out the far end through an overflow device (10). The overflow device (10) incorporated at the far end of the trough (4) is used in conjunction with tilting of the apparatus

(1), changes in glass flow rate, and changes in glass viscosity to regulate the thickness profile of the sheet.

Please replace the paragraph on page 11, lines 2-12 with the following paragraph at page 11, line 2:

Operational adjustment of any wedge or curvature in the sheet thickness may be effected by tilting the apparatus (1) and by varying the portion of glass (22) flowing to the overflow device (10). For instance, if the glass (2) at the far end is thinner than at the inlet end, lowering the far end will flow more glass (2) to that end, consequently thickening the sheet at the far end. Conversely, increasing the portion of glass (22) flowing to the overflow (10) will decrease the glass thickness at the far end of the forming apparatus. Since the two effects are nonlinear, different combinations of tilt and overflow glass can produce corrections in both curvature and in wedge. This will allow for a longer production campaign with a given forming apparatus, thus reducing manufacturing down time with a resultant cost saving.

Amendments of the Claims:

A detailed listing of all claims in the application is presented below. This listing of claims will replace all prior versions, and listings, of claims in the application. All claims being currently amended are submitted with markings to indicate the changes that have been made relative to immediate prior version of the claims. The changes in any amended claim are being shown by strikethrough (for deleted matter) or underlined (for added matter).

1. (Currently Amended) An improved apparatus for forming sheet glass, wherein the apparatus includes a trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, and wherein the improvement comprises:

   an overflow device on the trough that allows at least some of the molten glass within the trough to overflow a top of a far end of the trough without flowing over the downwardly sloping sides of the wedged shaped sheet forming structure.

2. (Original) The improved apparatus for forming sheet glass of claim 1 wherein the improvement further comprises the top of the sides of the trough being substantially curved along their length.

3. (Original) The improved apparatus for forming sheet glass of claim 1 wherein the improvement further comprises the bottom of the trough being substantially curved or chamfered to reduce areas where the molten glass flows significantly slower than the average molten glass flow rate in the trough.

4. (Original) The apparatus for forming sheet glass of claim 1 wherein the improvement further comprises heating elements that can be used to differentially heat the molten glass as it is flowing to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus.

5. (Currently Amended) An improved apparatus for forming sheet glass, wherein the apparatus includes a trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, and wherein the improvement comprises:

~~a)~~ substantially curved top sides of the trough, wherein a substantial portion of said curved top sides has a convex upward shape, such that a substantially uniform thickness glass sheet is formed when glass flows into the trough and over the sides of the trough.

6. (Original) The apparatus for forming sheet glass of claim 5 wherein the improvement further comprises heating elements that can be used to differentially heat the molten glass as it is flowing to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus.

7. (Original) The improved apparatus for forming sheet glass of claim 5 wherein the improvement further comprises the bottom of the trough being substantially curved or chamfered to reduce areas where the molten glass flows significantly slower than the average molten glass flow rate in the trough.

8. (Currently Amended) An improved apparatus for forming sheet glass, wherein the apparatus includes an inflow pipe for delivering molten glass, a trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, and wherein the improvement comprises:

~~a)~~ the~~an~~ inflow pipe shaped to modify the way molten glass flows into the trough such that the molten glass has a more uniform time dependent flow throughout the

trough relative to how molten glass would flow if it passed through a cylindrical pipe.

9. (Original) The improved apparatus for forming sheet glass of claim 8 wherein the improvement further comprises the top of the sides of the trough being substantially curved along their length.

10. (Original) The improved apparatus for forming sheet glass of claim 8 wherein the improvement further comprises the bottom of the trough being substantially curved or chamfered to reduce areas where the molten glass flows significantly slower than the average molten glass flow rate in the trough.

11. (Original) The improved apparatus for forming sheet glass of claim 8 wherein the improvement further comprises heating elements that can be used to differentially heat the molten glass as it is flowing to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus.

12. (Original) The improved apparatus for forming sheet glass of claim 8 wherein the improvement further comprises an overflow device on the trough that allows at least some of the molten glass within the trough to overflow the trough without flowing over the downwardly sloping sides of the wedged shaped sheet forming structure.

13. (Currently Amended) An improved apparatus for forming sheet glass, wherein the apparatus includes a ~~a~~ trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, and wherein the improvement comprises:

~~a)~~ an internally mounted flow control plug that can be inserted and adjusted within the trough to change at least one flow characteristic of the molten glass within the trough.

14. (Original) The improved apparatus for forming sheet glass of claim 13 wherein the improvement further comprises the top of the sides of the trough being substantially curved along their length.

15. (Original) The improved apparatus for forming sheet glass of claim 13 wherein the improvement further comprises the bottom of the trough being substantially curved or chamfered to reduce areas where the molten glass flows significantly slower than the average molten glass flow rate in the trough.

16. (Original) The improved apparatus for forming sheet glass of claim 13 wherein the improvement further comprises heating elements that can be used to differentially heat the molten glass as it is flowing to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus.

17. (Original) The apparatus for forming sheet glass of claim 13 wherein the improvement further comprises an overflow device on the trough that allows at least some of the molten glass within the trough to overflow the trough without flowing over the downwardly sloping sides of the wedged shaped sheet forming structure.

18. (Original) The apparatus for forming sheet glass of claim 13 wherein the improvement further comprises an inflow pipe shaped to modify the way molten glass flows into the trough such that the molten glass has a more uniform time dependent flow throughout the trough relative to how molten glass would flow if it passed through a cylindrical pipe.

19. (Currently Amended) An improved apparatus for forming sheet glass, wherein the apparatus includes a ~~a~~ trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, and wherein the improvement comprises:

~~a)~~ heating elements that can be used to differentially heat the molten glass it is flowing to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus, wherein the heating elements heat the molten glass on a top and the

sides of the wedged shaped sheet forming structure substantially before the glass from each side of the wedged shaped sheet forming structure meets at the bottom of the wedge.

20. (Currently Amended) An apparatus for forming sheet glass comprising:

a) an inflow pipe of appropriate structure for conveying molten glass under pressure;

b) a trough having sides and a top attached to the inflow pipe wherein the trough receives the molten glass;

c) an orifice running along the top of the trough such that as molten glass is conveyed to the trough the molten glass exits through the orifice and passes down the sides of the trough; and

d) a wedged shaped sheet forming structure attached to the trough and that has downwardly sloping sides converging at the bottom of the structure to form the wedge shape such that a glass sheet of substantially uniform thickness is formed when molten glass flows down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge.

21. (Currently Amended) The apparatus for forming sheet glass of claim 20 wherein the orifice is narrow along the top of the trough closest to the inflow pipe and widens for at least a portion of the length of the orifice further away from the inflow pipe such that as the glass loses static pressure as it flows ~~to~~ through the trough the widening orifice maintains a uniform~~constant~~ flow of glass through the orifice along its length.

22. (Currently Amended) The apparatus for forming sheet glass of claim 20 further comprising an internally mounted flow control plug that can be inserted and adjusted within the trough to change at least one flow characteristic of the molten glass within the trough.

23. (Original) The apparatus for forming sheet glass of claim 20 wherein the bottom of the trough is curved or chamfered to reduce areas where the molten glass flows significantly slower than the average molten glass flow rate in the trough.

24. (Original) The apparatus for forming sheet glass of claim 20 wherein the shape of the inflow pipe modifies the way molten glass flows into the trough such that the molten glass has a more uniform time dependent flow throughout the trough relative to how molten glass would flow if it passed through a cylindrically shape inflow pipe.

25. (Original) The apparatus for forming sheet glass of claim 20 further comprising heating elements that can be used to differentially heat the molten glass as it is flowing to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus.

26. (Original) The apparatus for forming sheet glass of claim 20 further comprising an orifice in the bottom of the trough that allows molted glass to flow to the bottom of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus.

27. (Original) The apparatus for forming sheet glass of claim 26 wherein the elements of the trough are held together with a glass seal such that adjustments in the shape of the trough or orifices may be made.

28. (Original) The apparatus for forming sheet glass of claim 26 wherein the top of the sides of the trough being substantially curved along their length.

29. (Original) The apparatus for forming sheet glass of claim 20 further comprising two orifices in the side of the trough that allows molten glass to flow to the downwardly sloped sides of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus.

30. (Original) The apparatus for forming sheet glass of claim 29 wherein the elements of the trough are held together with a glass seal such that small adjustments in the shape of the trough or orifices may be made.

31. (Original) The apparatus for forming sheet glass of claim 22 further comprising heating elements that can be used to differentially heat the molten glass as it is flowing to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus.

32. (Currently Amended) An improved method for forming sheet glass using an apparatus that includes a trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge and forming such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, wherein the improvement comprises:

a) providing an overflow device on the trough;

b) positioning the forming apparatus such that at least some of the molten glass within the trough passes out of a top of a far end of the trough through the overflow device without flowing over the downwardly sloping sides of the wedged shaped sheet forming structure; and

c) flowing molten glass into the trough such that a glass sheet of substantially uniform thickness is formed.

33. (Original) The improved method for forming sheet glass of claim 32 wherein the improvement further comprises adjusting both the tilt of the trough and the amount of molten glass passing through the overflow device.

34. (Currently Amended) An improved method for forming sheet glass using an apparatus that includes a trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge and forming such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, wherein the improvement comprises:

a) providing heating elements that can differentially heated the molten glass as it flows, wherein the heating elements heat the molten glass on a top and the sides of the wedged shaped sheet forming structure substantially before the glass from each side of the wedged shaped sheet forming structure meets at the bottom of the wedge.; and

b) flowing molten glass into the trough and heating the molten glass differentially to adjust for wedge or curvature irregularities such that a glass sheet of substantially uniform thickness is formed.

35. (Currently Amended) An improved method for forming sheet glass using an apparatus that includes an inflow pipe for delivering molten glass, a trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, and wherein the improvement comprises:

a) providing the~~an~~ inflow pipe shaped to modify the way molten glass flows into the trough such that the molten glass has a more uniform time dependent flow throughout the trough relative to how molten glass would flow if it passed through a cylindrical pipe ~~providing an overflow device on the trough~~; and

b) flowing molten glass into the trough such that a glass sheet of substantially uniform thickness is formed.

36. (Currently Amended) An improved method for forming sheet glass using an apparatus that includes a trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, and wherein the improvement comprises:

a) providing an internally mounted flow control plug that can be inserted and adjusted within the trough;

b) using the flow control plug to adjust at least one flow characteristic of the molten glass within the trough;

~~c) providing an overflow device on the trough;~~ and

c) flowing molten glass into the trough such that a glass sheet of substantially uniform thickness is formed.~~.~~

37. (Original) A method for forming sheet glass comprising:

a) providing an inflow pipe connected to a trough having sides and a top attached to the inflow pipe;

b) providing an orifice running along the top of the trough;

c) providing a wedged shaped sheet forming structure attached to the trough that has downwardly sloping sides converging at the bottom of the structure to form the wedge; and

d) conveying molten glass under pressure through the inflow pipe into the trough such that the molten glass exits through the orifice and flows down the sides of the trough and the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge and forms a glass sheet of substantially uniform thickness.

38. (Currently Amended) The method for forming sheet glass of claim 37 wherein the orifice is narrow along the top of the trough closest to the inflow pipe and widens for at least a portion of the length of the orifice further away from the inflow pipe such that as the glass loses static pressure as it flows through the trough a uniform~~constant~~ flow of glass is maintained along the length of the widening orifice.

39. (Original) The method for forming sheet glass of claim 37 further comprising providing a flow control plug that can be inserted and adjusted within the trough and using the flow control plug to change at least one flow characteristic of the molten glass within the trough.

40. (Cancelled)

41. (Cancelled)

42. (Original) The method for forming sheet glass claim 37 further comprising heating the molten glass differentially to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus.

43. (Currently Amended) The method for forming sheet glass claim 37 further comprising providing an orifice in the bottom of the trough that allows moltend glass to flow to the bottom of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus.

44. (Original) The method for forming sheet glass of claim 43 wherein the elements of the trough are held together with a glass seal such that adjustments in the shape of the trough or orifices may be made.

45. (Original) The method for forming sheet glass of claim 37 further comprising providing two orifices in the side of the trough that allows molten glass to flow to the downwardly sloped sides of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus.

46. (Original) The method for forming sheet glass of claim 45 wherein the elements of the trough are held together with a glass seal such that small adjustments in the shape of the trough or orifices may be made.

47. (New) The apparatus for forming sheet glass of claim 17, wherein the elements of the trough are held together with a glass seal such that small adjustments in a position of the flow control plug may be made.

48. (New) The apparatus for forming sheet glass of claim 13, wherein the elements of the trough are held together with a glass seal such that small adjustments in a position of the flow control plug may be made.

49. (New) An improved apparatus for forming sheet glass, wherein the apparatus includes a trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, and wherein the improvement comprises:

an orifice in the bottom of the trough that allows molten glass to flow to the bottom of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus and virgin glass forms an outside surface of the glass sheet.

50. (New) The apparatus for forming sheet glass of claim 49 wherein the elements of the trough are held together with a glass seal such that adjustments in the shape of the trough or orifices may be made.

51. (New) An improved apparatus for forming sheet glass, wherein the apparatus includes a trough for receiving molten glass that has sides attached to a wedged shaped sheet forming structure that has downwardly sloping sides converging at the bottom of the wedge such that a glass sheet is formed when molten glass flows over the sides of the trough, down the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge, and wherein the improvement comprises:

two orifices in the side of the trough that allow molten glass to flow to the downwardly sloped sides of the wedge shaped forming apparatus such that molten glass is

added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus and virgin glass forms an outside surface of the glass sheet.

52. (New) The apparatus for forming sheet glass of claim 51 wherein the elements of the trough are held together with a glass seal such that adjustments in the shape of the trough or orifices may be made.

53. (New) The apparatus for forming sheet glass of claim 51, further comprising an overflow device on the trough that allows at least some of the molten glass within the trough to overflow a top of a far end of the trough without flowing over the downwardly sloping sides of the wedged shaped sheet forming structure.

54. (New) The improved method for forming sheet glass of claim 34 wherein the improvement further comprises the step of adjusting a tilt of the trough.

55. (New) The improved method for forming sheet glass of claim 37 wherein the improvement further comprises the step of adjusting a tilt of the trough.

56. (New) The improved method for forming sheet glass of claim 36, wherein the elements of the trough are held together with a glass seal such that small adjustments in a position of the flow control plug may be made.

57. (New) The improved method for forming sheet glass of claim 39, wherein the elements of the trough are held together with a glass seal such that small adjustments in a position of the flow control plug may be made.

58. (New) The apparatus for forming sheet glass of claim 21 further comprising an internally mounted flow control plug that can be inserted and adjusted within the trough to change at least one flow characteristic of the molten glass within the trough.

59. (New) The apparatus for forming sheet glass of claim 57 wherein the elements of the trough are held together with a glass seal such that adjustments in a position of the flow control plug may be made.

60. (New) The apparatus for forming sheet glass of claim 21 wherein the bottom of the trough is curved or chamfered to reduce areas where the molten glass flows significantly slower than the average molten glass flow rate in the trough.

61. (New) The apparatus for forming sheet glass of claim 21 wherein the shape of the inflow pipe modifies the way molten glass flows into the trough such that the molten glass has a more uniform time dependent flow throughout the trough relative to how molten glass would flow if it passed through a cylindrically shape inflow pipe.

62. (New) The apparatus for forming sheet glass of claim 21 further comprising heating elements that can be used to differentially heat the molten glass as it is flowing to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus.

63. (New) The apparatus for forming sheet glass of claim 21 further comprising an orifice in the bottom of the trough that allows molted glass to flow to the bottom of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus.

64. (New) The apparatus for forming sheet glass of claim 63 wherein the elements of the trough are held together with a glass seal such that adjustments in the shape of the trough or orifices may be made.

65. (New) The apparatus for forming sheet glass of claim 21 further comprising two orifices in the side of the trough that allow molten glass to flow to the downwardly sloped sides of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus.

66. (New) The apparatus for forming sheet glass of claim 65 wherein the top of the sides of the trough are substantially curved along their length.

67. (New) The apparatus for forming sheet glass of claim 66 wherein the elements of the trough are held together with a glass seal such that small adjustments in the shape of the trough or orifices may be made.

68. (New) The apparatus for forming sheet glass of claim 22 wherein the elements of the trough are held together with a glass seal such that adjustments in a position of the flow control plug may be made.

69. (New) The improved method for forming sheet glass of claim 36, further comprising the step of providing an overflow device on the trough.

70. (New) The improved method for forming sheet glass of claim 69 wherein the elements of the trough are held together with a glass seal such that adjustments in a position of the flow control plug may be made.

71.(New) The improved method for forming sheet glass of claim 69, wherein the improvement further comprises the step of adjusting a tilt of the trough.

72. (New) The improved method for forming sheet glass of claim 36, wherein the improvement further comprises the step of adjusting a tilt of the trough.

73. (New) The method for forming sheet glass of claim 38 further comprising the steps of providing a flow control plug that can be inserted and adjusted within the trough and using the flow control plug to change at least one flow characteristic of the molten glass within the trough.

74. (New) The improved method for forming sheet glass of claim 73, wherein the elements of the trough are held together with a glass seal such that small adjustments in a position of the flow control plug may be made.

75. (New) The method for forming sheet glass claim 38 further comprising the step of heating the molten glass differentially to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus.

76. (New) The method for forming sheet glass claim 38 further comprising the step of providing an orifice in the bottom of the trough that allows molted glass to flow to the bottom of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus.

77. (New) The method for forming sheet glass of claim 76 wherein the elements of the trough are held together with a glass seal such that adjustments in the shape of the trough or orifices may be made.

78. (New) The method for forming sheet glass of claim 38 further comprising the step of providing two orifices in the side of the trough that allow molten glass to flow to the downwardly sloped sides of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus.

79. (New) The method for forming sheet glass of claim 78 wherein the elements of the trough are held together with a glass seal such that small adjustments in the shape of the trough or orifices may be made.

80. (New) The method for forming sheet glass of claim 38 wherein the improvement further comprises the step of adjusting a tilt of the trough.

Amendments to the Drawings:

The attached sheet(s) of drawings include changes as listed below. The attached replacement sheet(s) replace the original sheet(s).

The changes are as follows.

Figures 1a through 1c have been labeled as "PRIOR ART".

The glass flowing over the far end of the trough has been relabeled (22) to clarify that this glass is different from the glass which overflows the sides of the trough.

Attachment: 4 Replacement Sheets

REMARKS

The office action of June 23, 2003 has been reviewed and its contents carefully noted. Reconsideration of this case, as amended, is requested. Claims 1 through 39 and 42-80 remain in this case, claims 1, 5, 8, 13, 19-22, 32, 34-36, 38 and 43 being amended, claims 40-41 being cancelled and claims 47-80 being added by this response. No new matter has been added.

Although the Examiner stated that claims 21 and 38 were allowable, these claims have been amended to further clarify the claims without altering their scope. These changes are fully supported by the specification, as filed. "The orifice (20) is narrow at the inlet end and very wide at the far end to accommodate for the loss in static pressure of the glass (2) as it flows to that end. The complex shape of the orifice (20) is designed to produce the desired uniform flow from the trough (4) to the sides of the apparatus (1)." (present application, page 14, lines 15-18).

The numbered paragraphs below correspond to the numbered paragraphs in the Office Action.

Objection to the Drawings

1. The Examiner objected to the drawings because he stated that Figures 1 a-1 c and 2a-2c should be designated by a legend such as --Prior Art-- because only that which is old was illustrated.

Figures 1a through 1c have been amended to overcome this objection. Specifically, the legend "PRIOR ART" has been added to the Figure sheet containing Figure 1a through Figure 1c. If accepted, the Applicant proposes to amend the proposed Figures as shown in the drawings. Reconsideration and withdrawal of the objection to Figures 1 a through 1c is respectfully requested.

The Applicant respectfully disagrees with the Examiner's characterization of Figure 2a through 2c as prior art. The application specifically discusses Figure 2 in the context of an embodiment of the invention. The apparatus shown is not prior art. Although the Examiner states that only Figures 2a through 2c should be labeled as prior art, Figure 2 should be

considered as a whole, and as such, it is not prior art, but an embodiment of the present invention.

The specification states that "Figures 2a, 2b, 2c and 2d show a top, side, end and an inlet view of an embodiment of a forming apparatus that has a trough with straight sloped weirs, a contoured bottom and an overflow device." (present application, page 5, lines 4-6). In addition, the specification discusses the embodiment of Figure 2 extensively.

Overflow Device

"Referring to Figures 2a, 2b, 2c and 2d, the present invention provides a forming apparatus (1) that can be used to make substantially constant thickness glass (2) over an expended range of values of the mathematical product of glass flow and glass viscosity by using a combination of the tilt of the apparatus (1) with a change in glass flow through an overflow device (10) at the far end of the apparatus (1).

The forming apparatus shown in Figures 2a-2d has straight sloped weirs (5) that are close to parallel with the pointed edge of the wedge shaped portion of the forming apparatus (1) but sloped slightly downward in the direction away from the inflow pipe (3). Glass (2) enters the trough (4) through an inflow pipe (3). The bottom and sides of the trough (4) are contoured in a manner to provide even distribution of glass to the top of each side weir (5). The major portion of the glass (2) then flows over the top of each side weir (5), down each side of the wedge shaped portion of the forming apparatus (1), and joins at the bottom of the wedge to form a sheet of molten glass (2). The molten glass (2) is then cooled to form a solid glass sheet of substantially uniform thickness. A small portion of the glass (2) passes through the forming trough (4) and out the far end through an overflow device (10). The overflow device (10) incorporated at the far end of the trough (4) is used in conjunction with tilting of the apparatus (1), changes in glass flow rate, and changes in glass viscosity to regulate the thickness profile of the sheet.

The sheet glass forming apparatus is designed for constant temperature operation in the region of the forming trough (4) and the weirs (5). The linear sheet thickness differential from one end of the sheet to the other end is called wedge. The nonlinear sheet thickness variations from one end of the sheet to the other end is called curvature. The wedge and curvature are primarily a function of the trough (4) shape and the shape of the weirs (5) on each side of the trough (4). The glass (2) sheet thickness distribution is the same for a given value of the mathematical product of glass flow rate times the glass viscosity. A change in either of these variables independent of the other will produce wedge and/or curvature in the sheet thickness distribution.

Operational adjustment of any wedge or curvature in the sheet thickness may be effected by tilting the apparatus (1) and by varying the portion of glass (2) flowing to the overflow device (10). For instance, if the glass (2) at the far end is thinner than at the inlet end, lowering the far end will flow more glass (2) to that end, consequently thickening the sheet at the far end. Conversely, increasing the portion of glass (2) flowing to the overflow (10) will decrease the glass thickness at the far end of the forming apparatus. Since the two effects are nonlinear, different combinations of tilt and overflow glass can produce corrections in both curvature and in wedge. This will allow for a longer production campaign with a given forming apparatus, thus reducing manufacturing down time with a resultant cost saving." (present application, page 10, line 4 through page 11, line 12).

Reconsideration and withdrawal of the objection to Figures 2a through 2c is respectfully requested.

Figures 2-4 have been amended to clarify that the glass (22) flowing over the far end of the trough is different than the glass (2), which flows over the top of each side weir. No new matter has been added, since the specification, as filed, distinguished between the two glass flows. "The major portion of the glass (2) then flows over the top of each side weir (5), down each side of the wedge shaped portion of the forming apparatus (1), and joins at the bottom of the wedge to form a sheet of molten glass (2).... A small portion of the glass (2) passes through the forming trough (4) and out the far end through an overflow device (10)." (present application, page 10, lines 15-20).

Objections to the Specification

2. The Examiner objected to the specification because he stated that the title of the invention was not descriptive. The specification has been amended to overcome this objection. Specifically, per the Examiner's suggestion, the title has been amended to "Overflow Downdraw Glass Forming Method and Apparatus". Reconsideration and withdrawal of the objection to the title is respectfully requested.

3. The disclosure was objected to because the filing date of the fourth provisional application (line 11) should be July 21, 2000. The specification has been amended to overcome this objection. Reconsideration and withdrawal of the objection is respectfully requested.

The specification has been amended to further clarify that the glass overflowing a top of the far end of the trough is different from the glass flowing over the weirs. More specifically, the glass overflowing a top of the far end of the trough is now labeled (22) in the figures, and discussed as (22) in the specification. This amendment merely clarifies that the glass overflowing a top of the far end of the trough due to the overflow device is different than the major portion of the glass (2), which "flows over the top of each side weir (5), down each side of the wedge shaped portion of the forming apparatus (1), and joins at the bottom of the wedge to form a sheet of molten glass (2)". (present application, page 10, lines 15-17). No new matter has been added.

Rejections under 35 USC § 112

5. Claims 8-12 and 35 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. Claim 8 recites the limitation "an inflow pipe" in lines 1-2 as well as line 8. Claim 8 has been amended to overcome this rejection. Reconsideration and withdrawal of the rejection of claims 8-12 is respectfully requested.

7. Claim 35 recites the limitation "an inflow pipe" in lines 1-2 as well as line 8. Claim 35 has been amended to overcome this rejection. Reconsideration and withdrawal of the rejection of claim 35 is respectfully requested.

Rejections under 35 USC § 102

9. Claims 1 and 32 were rejected under 35 U.S.C. 102(b) as being anticipated by Leibowitz (US 3607182). Applicant respectfully disagrees.

Unless all of the same elements are found in exactly the same situation and united in the same way to perform the identical function in prior pleaded art, there is no anticipation." *Stauffer v. Slenderella Systems of California, Inc.*, 254 F.2d 127, 115 USPQ 347 (9th Cir. 1957).

As amended, claim 1 includes "an overflow device on the trough that allows at least some of the molten glass within the trough **to overflow a top of a far end of the trough without**

flowing over the downwardly sloping sides of the wedged shaped sheet forming structure" (emphasis added). This amendment is fully supported by Figures 2 through 4, and the specification, as filed. Specifically, the specification states that "[a] small portion of the glass (22) passes through the forming trough (4) and out the far end through an overflow device (10)." (present application page 10, lines 18-20).

The Examiner stated that the features of claim 1 are found in the figures, the abstract, and col. 2, line 67 to col. 3, line 60. The Examiner also stated that glass removed via the evacuation channel does not flow over the downwardly sloping sides of the wedge shaped sheet forming structure in Leibowitz.

The purpose of the Leibowitz apparatus is to remove bubbles from the glass which formed at the joint of the top and bottom pieces (see Abstract; Col. 1, lines 5-19).. An excerpt from the cited passage explains the operation of the Leibowitz apparatus. "In operation, molten glass G delivered to trough 16 overflows upper edges 18 and flows downwardly along opposed sidewall portions 20 and downwardly converging sidewall portions 22 to root 24, where the separate flows are united and withdrawn as a single sheet.... [T]he vacuum applied to the sealed accumulator 44 by the vacuum pump, is in turn applied to the slot 26 through a confined path by means of of evacuation channel 28 and heated conduit 40. As a result, molten glass containing bubbles B is drawn from the outside edges of the slot towards the center and through the holes or openings 32 in cover plate 30 downwardly into evacuation channel 28 and along heated conduit 40 into the accumulator 44." (Leibowitz, col. 3, lines 36-40, lines 52-60). Leibowitz only shows molten glass overflowing the trough 16 and flowing downwardly along the sidewall portions 22 and 24.

The evacuation channel 28 in Leibowitz is below the trough. Overflow in amended claim 1 is on a top of a far end of the trough. The molten glass within the trough is not even overflowing the trough when it is directed through the evacuation channel in Leibowitz. In addition, there is no glass overflowing a top of a far end of the trough in Leibowitz.

In order to avoid rejection for anticipation, it is only necessary to show that a claim contains at least one element not disclosed in a single prior art reference. Since amended claim 1 recites elements which are not disclosed in the Leibowitz reference, it is respectfully proposed

that the rejection of claim 1 for anticipation by the Leibowitz reference is overcome. Reconsideration and withdrawal of the rejection of claim 1 is respectfully requested.

As amended, claim 32 includes the step of "b) positioning the forming apparatus such that at least some of the molten glass within the trough **passes out of a top of a far end of the trough through the overflow device without flowing over the downwardly sloping sides of the wedged shaped sheet forming structure**" (emphasis added). The Examiner stated that the features of claim 32 are found in the figures, the abstract, and col. 2, line 67 to col. 3, line 60. The Examiner also stated that glass removed via the evacuation channel does not flow over the downwardly sloping sides of the wedge shaped sheet forming structure in Leibowitz.

An excerpt from the cited passage explains the operation of the Leibowitz apparatus. "In operation, molten glass G delivered to trough 16 overflows upper edges 18 and flows downwardly along opposed sidewall portions 20 and downwardly converging sidewall portions 22 to root 24, where the separate flows are united and withdrawn as a single sheet.... [T]he vacuum applied to the sealed accumulator 44 by the vacuum pump, is in turn applied to the slot 26 through a confined path by means of evacuation channel 28 and heated conduit 40. As a result, molten glass containing bubbles B is drawn from the outside edges of the slot towards the center and through the holes or openings 32 in cover plate 30 downwardly into evacuation channel 28 and along heated conduit 40 into the accumulator 44." (Leibowitz, col. 3, lines 36-40, lines 52-60). Leibowitz only shows molten glass overflowing the trough 16 and flowing downwardly along the sidewall portions 22 and 24.

The evacuation channel 28 in Leibowitz is below the trough. Overflow in amended claim 32 is on a top of a far end of the trough. The molten glass within the trough is not even overflowing the trough when it is directed through the evacuation channel in Leibowitz. In addition, there is no glass overflowing a top of a far end of the trough in Leibowitz.

In order to avoid rejection for anticipation, it is only necessary to show that a claim contains at least one element not disclosed in a single prior art reference. Since amended claim 32 recites elements which are not disclosed in the Leibowitz reference, it is respectfully proposed that the rejection of claim 1 for anticipation by the Leibowitz reference is overcome. Reconsideration and withdrawal of the rejection of claim 32 is respectfully requested.

10. Claim 5 was rejected under 35 U.S.C. 102(b) as being clearly anticipated by Aoki (JP 9-110443). Applicant respectfully disagrees.

As amended, the apparatus of claim 5 includes "substantially curved top sides of the trough, **wherein a substantial portion of said curved top sides has a convex upward shape,** such that a substantially uniform thickness glass sheet is formed when glass flows into the trough and over the sides of the trough." This amendment is fully supported by Figures 3-7, which show the curved top sides of the trough as linear or convex.

The surfaces Aoki shows and describes are concave. "[S]lopes of the depression gradient which are increasing higher on the inner side in the transverse direction of the groove and decreasing lower on the outer side." (Abstract). Therefore, claim 5 is not anticipated by Aoki. Reconsideration and withdrawal of the rejection is respectfully requested.

11. Claims 13, 15 and 36 were rejected under 35 U.S.C. 102(b) as being clearly anticipated by Ward (US 3589887). Applicant respectfully disagrees.

Regarding claim 13, as amended, the apparatus includes "an internally mounted flow control plug that can be inserted and adjusted within the trough to change at least one flow characteristic of the molten glass within the trough." The Examiner states that the features of applicant's claims can be found in the figures and col. 2, lines 2-42 of Ward. The Examiner does not explain exactly which component of the apparatus in the patent is equivalent to the flow control plugs in the present invention.

The Applicant will assume for argument here that the Examiner believes that the "edge controlling means" 30 are flow control plugs. The Applicant does not believe that the edge controlling means 30 are at all similar to the flow control plug described in claim 13. The edge controlling means in Ward are described in the patent. "Edge controlling means 30 which are illustrated as being pyramidal in shape and suitably supported for adjustment by supports 32 are inserted in the trough 18 and into the glass therein, so as to restrict or control the quantity of glass which flows over the edges 20 at the ends of the nozzle 10, thinning the streams at the ends yet producing a substantially uniform-thickness ribbon 28 which can then be transported, in any conventional manner, away from the nozzle." (Ward, col. 2, lines 11-20). The pyramidal edge

controlling means in Ward is very different from the internally mounted flow control plug of claim 13. Figures 12, 13, and 17, and 18 of the present application show the flow control plug (30). It is internally mounted within the trough. In contrast, the Ward edge controlling means is located on top of the trough. In the present invention, "[t]he flow control plug (30), an example shape of which is shown in Figures 13a-13c, is designed to modulate the flow in the trough (4) such that the static pressure at the inlet to the orifice (20) is constant along its entire length." (present application, page 17, lines 1-4).

In addition, a key advantage of the overflow apparatus and process is that the useable glass surface is formed from homogeneous virgin internal glass. "Sheet glass made using the apparatus of U.S. patent number 3,338,696, incorporated herein by reference, makes the highest quality glass as formed and does not require post-processing. The patent teaches a manufacturing process termed: "the overflow process". The key feature of the overflow process is that the glass moves through the glass forming equipment and the untouched, "virgin glass", overflows and becomes the outside surface of the glass. Glass made using other processes requires grinding and/or polishing and thus does not have as fine a surface finish." (present application, page 2, lines 7-13).

The Ward patent violates the requirement that the useable glass surface be formed from homogeneous virgin internal glass. The external flow control device in Ward contacts the external surface of the glass. Thus if the device does control the glass thickness at the edges as implied, the surface of the glass at the edges would be contaminated such that it would be unusable. The flow control device in claim 13, in contrast, is internal to the glass stream and in a location that does not contaminate the saleable glass sheet.

The edge thickness control shown in the Ward patent is easily performed by adjustment of the contour of the weir and/or the trough bottom or other sub-surface device. In contrast, claim 13 includes a subsurface flow control plug, more specifically, "an internally mounted flow control plug that can be inserted and adjusted within the trough to change at least one flow characteristic of the molten glass within the trough." This element of the claim is not shown in Ward. Reconsideration and withdrawal of the rejection of claim 13 is respectfully requested.

Dependent claim 15, being dependent upon and further limiting independent claim 13, should also be allowable for that reason, as well as for the additional recitations it contains. Applicant respectfully requests reconsideration of the rejection of claim 15, in view of the above amendments and remarks.

Regarding claim 36, as amended, the method includes the steps of "a) providing an internally mounted flow control plug that can be inserted and adjusted within the trough; [and] b) using the flow control plug to adjust at least one flow characteristic of the molten glass within the trough; such that a glass sheet of substantially uniform thickness is formed."

The Examiner states that the features of applicant's claims can be found in the figures and col. 2, lines 2-42 of Ward. The Examiner does not explain exactly which component of the apparatus in the patent is equivalent to the flow control plugs in the present invention.

The Applicant will assume for argument here that the Examiner believes that the "edge controlling means" 30 are flow control plugs. The Applicant does not believe that the edge controlling means 30 are at all similar to the flow control plug described in claim 36. As discussed above, the edge controlling means in Ward are described in the patent. "Edge controlling means 30 which are illustrated as being pyramidal in shape and suitably supported for adjustment by supports 32 are inserted in the trough 18 and into the glass therein, so as to restrict or control the quantity of glass which flows over the edges 20 at the ends of the nozzle 10, thinning the streams at the ends yet producing a substantially uniform-thickness ribbon 28 which can then be transported, in any conventional manner, away from the nozzle." (Ward, col. 2, lines 11-20). The pyramidal edge controlling means in Ward is very different from the internally mounted flow control plug of claim 36. Figures 12, 13, and 17, and 18 of the present application show the flow control plug (30). It is internally mounted within the trough. In contrast, the Ward edge controlling means are located on top of the trough. In the present invention, "[t]he flow control plug (30), an example shape of which is shown in Figures 13a-13c, is designed to modulate the flow in the trough (4) such that the static pressure at the inlet to the orifice (20) is constant along its entire length." (present application, page 17, lines 1-4).

In addition, a key advantage of the overflow apparatus and process is that the useable glass surface is formed from homogeneous virgin internal glass. "Sheet glass made using the

apparatus of U.S. patent number 3,338,696, incorporated herein by reference, makes the highest quality glass as formed and does not require post-processing. The patent teaches a manufacturing process termed: "the overflow process". The key feature of the overflow process is that the glass moves through the glass forming equipment and the untouched, "virgin glass", overflows and becomes the outside surface of the glass. Glass made using other processes requires grinding and/or polishing and thus does not have as fine a surface finish." (present application, page 2, lines 7-13).

The Ward patent violates the requirement that the useable glass surface be formed from homogeneous virgin internal glass. The flow control device in Ward contacts the external surface of the glass. Thus if the device does control the glass thickness at the edges as implied, the surface of the glass at the edges would be contaminated such that it would be unusable. The flow control device in claim 36, in contrast, is internal to the glass stream and in a location that does not contaminate the saleable glass sheet. Reconsideration and withdrawal of the rejection of claim 36 is respectfully requested.

12. Claims 19 and 34 were rejected under 35 U.S.C. 102(b) as being clearly anticipated by Overman (US 3506429). Applicant respectfully disagrees.

The Examiner states that the features of applicant's claims can be found in the figures and col. 3, line 27 to col. 4, line 46 of Overman.

The Overman patent is designed to effect the flow of glass at the root of the draw (when the glass meets at the bottom of the apparatus) as it is being drawn and solidified. The macroscopic longitudinal distribution of the glass as it flows down the side of the forming apparatus is determined by the distribution of the glass flowing over the weirs. The Overman patent, because it has no influence on the flow of glass over the weirs, can only affect the glass thickness over a limited longitudinal distance.

Amended claim 19 includes, "heating elements that can be used to differentially heat the molten glass as it is flowing to adjust for wedge or curvature irregularities within the sheet glass being formed by the apparatus, **wherein the heating elements heat the molten glass on a top and the sides of the wedged shaped sheet forming structure substantially before the glass**

from each side of the wedged shaped sheet forming structure meets at the bottom of the wedge", (emphasis added) while the method in claim 34 includes the steps of "a) providing heating elements that can differentially heat the molten glass as it flows, **wherein the heating elements heat the molten glass on a top and the sides of the wedged shaped sheet forming structure substantially before the glass from each side of the wedged shaped sheet forming structure meets at the bottom of the wedge**". (emphasis added). These amendments are fully supported by the specification. "Additional thickness correction may be accomplished by selective heating or cooling of the molten glass (2) in the trough (4) and/or heating the weirs and thus the molten glass (2) flowing over the weirs and/or heating the orifice (20) and thus the molten glass (2) flowing through the orifice. One caveat with this approach is that the molten glass (2) flowing from the root (25) of the apparatus (1) must be of substantially uniform temperature. Therefore, the glass molten (2) would need to be selectively cooled or heated as it flows down the outside of the apparatus in order to produce the required substantially uniform temperature." (present application, page 24, lines 6-13). The amendments are also supported by Figure 24, which shows the heating elements above the point of draw.

The present invention, as claimed in claims 19 and 34, differentially heats the glass flowing in the trough cavity and over the weirs such that the macroscopic longitudinal thickness distribution of the glass as it flows down the side of the forming apparatus is effected to maintain a uniform thickness. Overman does not disclose differential heating as put forth in the claims. Instead, Overman only teaches heating at the root. The heating in Overman is always at the point of draw. "Although the point of draw has been utilized as a reference point, the heating of the glass sheet may take place slightly above this point, as on the side of the forming member 45, or it might take place slightly below the point of draw in the area where the sheet is being stretched during cooling to its final thickness." (col. 4, lines 26-31). Although the orientation of the heating elements in Overman may vary, the location is still at the root. In contrast, in claims 19 and 34, the heating elements heat the molten glass before it meets at the bottom of the wedge (the point of draw). Reconsideration and withdrawal of the rejection of claims 19 and 34 is respectfully requested.

13. Claims 20 and 37 were rejected under 35 U.S.C. 102(b) as being anticipated by Corning (GB 982153). Applicant respectfully disagrees.

Claim 20 includes, in part, "c) an orifice **running along the top of the trough** such that as molten glass is conveyed to the trough the molten glass exits through the orifice and passes down the sides of the trough". (emphasis added) The present application describes the orifice. "The forming apparatus can include an orifice **on top of the trough** and glass can be moved through the apparatus using pressure. The orifice is narrow at the inlet end and wider at the far end to accommodate for the loss in static pressure of the glass as it flows to that end." (present application, page 4, lines 11-14). (emphasis added) Also, see the orifice (20) in Figures 8, 9, 11, 14, 16, 19, and 20.

The Examiner states that the features of applicant's claims can be found in the figures and page 2, lines 21-54 and 67-111 of Corning; however, the Examiner does not explain which part of the Corning patent is equivalent to the orifice in claim 20(c). The Applicant will assume that the Examiner believes that the "circular apertures or passages 16" are equivalent to the orifice in claim 20. The "circular apertures or passages 16 [are] arranged in a row in the region of the top wall of the feeding member **comprising the bottom wall of the trough** 13." (Corning, col. 2, lines 75-79). (emphasis added) The passages are clearly in the bottom of the trough. They do not run along the top of the trough.

"Supply of molten glass to the reservoir, and thence to the trough via such passages, is from a head of glass having access to the reservoir at one end thereof. Such glass is supplied under a sufficient head to insure that a desired volume of glass issues from each of the respective passages to keep the trough supplied with a desired volume of glass in the respective regions along its length and without disturbing the streams of glass overflowing the trough." (Corning, col. 1, line 84 to col. 2, line 8). These apertures are very different from the orifice in the present application. There are multiple apertures in Corning, and these apertures are specifically arranged in a row to supply molten glass to the trough. The passages at the bottom of the trough produce streaks in the glass. This patent preceded U.S. Patent 3,338,696, which originally introduced the Overflow Process. The apparatus in Corning proved to be unworkable because, by having multiple flow control orifices in the bottom of the trough, they contaminate the homogeneous virgin internal glass which forms the sheet surface.

In contrast, in claim 20, there is a single orifice running along the top of the trough, which directs molten glass through its exit and down the sides of the trough. Therefore, Corning does not anticipate claim 20. Reconsideration and withdrawal of the rejection of claim 20 is respectfully requested.

Claim 37 includes, in part, the steps of "b) providing an orifice **running along the top of the trough**; [and] d) conveying molten glass under pressure through the inflow pipe into the trough such that the molten glass exits through the orifice and flows down the sides of the trough and the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge and forms a glass sheet of substantially uniform thickness." (emphasis added) The present application describes the orifice. "The forming apparatus can include an orifice **on top of the trough** and glass can be moved through the apparatus using pressure. The orifice is narrow at the inlet end and wider at the far end to accommodate for the loss in static pressure of the glass as it flows to that end." (present application, page 4, lines 11-14) (emphasis added). Also, see the orifice (20) in Figures 8, 9, 11, 14, 16, 19, and 20.

The Examiner states that the features of applicant's claims can be found in the figures and page 2, lines 21-54 and 67-111 of Corning; however, the Examiner does not explain which part of the Corning patent is the orifice in claim 37(b) and (d). The Applicant will assume that the Examiner believes that the "circular apertures or passages 16" are equivalent to the orifice in claim 20. As discussed above, the "circular apertures or passages 16 [are] arranged in a row in the region of the top wall of the feeding member comprising the bottom wall of the trough 13." (Corning, col. 2, lines 75-79). These apertures are very different from the orifice in the present application. There are multiple apertures in Corning, and these apertures are specifically arranged in a row in the bottom of the trough to supply molten glass to the trough. The passages at the bottom of the trough produce streaks in the glass. This patent preceded U.S. Patent 3,338,696, which originally introduced the Overflow Process. The apparatus in this patent proved to be unworkable because, by having multiple flow control orifices in the bottom of the trough, they contaminate the homogeneous virgin internal glass which forms the sheet surface.

In contrast, in claim 37, as molten glass is conveyed to the trough the molten glass exits through a single orifice on top of the trough and passes down the sides of the trough. Therefore,

Corning does not anticipate claim 37. Reconsideration and withdrawal of the rejection of claim 37 is respectfully requested.

Rejections under 35 USC § 103

15. Claim 2 was rejected under 35 U.S.C. 103(a) as being unpatentable over Leibowitz in view of Aoki. The Applicant respectfully disagrees. The argument above regarding the anticipation of claim 1 by Leibowitz is incorporated by reference here.

"'A claimed invention is unpatentable for obviousness if the differences between it and the prior art "are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art.' 35 U.S.C. §103(a) (1994); *Graham v. John Deere Co.*, 383 U.S. 1, 14, 148 USPQ 459, 465(1966). Obviousness is a legal question based on underlying factual determinations including: (1) the scope and content of the prior art, including what that prior art teaches explicitly and inherently; (2) the level of ordinary skill in the prior art; (3) the differences between the claimed invention and the prior art; and (4) objective evidence of nonobviousness. *Graham*, 383 U.S. at 17-18, 148 USPQ at 467; *In re Dembiczak*, 175 F.3d 994, 998, 50 USPQ 1614, 1616 (Fed. Cir. 1999); *In re Napier*, 55 F.3d 610, 613, 34 USPQ2d 1782, 1784(Fed. Cir. 1995) (stating that the inherent teachings of a prior art reference is a question of fact)." *In re Zurko*, 59 USPQ2d 1693, 1696 (Fed. Cir. 2001).

Regarding claim 1, Aoki does not provide what Leibowitz lacks. Aoki teaches an apparatus for producing a glass plate. As amended, claim 1 includes "an overflow device on the trough that allows at least some of the molten glass within the trough **to overflow a top of a far end of the trough without flowing over the downwardly sloping sides of the wedged shaped sheet forming structure**" (emphasis added). Aoki does not teach or suggest this aspect of the claim.

Since neither Leibowitz or Aoki, alone or in combination, teach or suggest the components of claim 1, amended claim 1 is not obvious over these two references. Dependent claim 2, being dependent upon and further limiting independent claim 1, should also be allowable for that reason, as well as for the additional recitations it contains. Applicant

respectfully requests reconsideration of the rejection of claim 2, in view of the above amendments and remarks.

17. Claim 3 was rejected under 35 U.S.C. 103(a) as being unpatentable over Leibowitz in view of Simon (US 3451798). Applicant respectfully disagrees. The argument above regarding the anticipation of claim 1 by Leibowitz is incorporated by reference here.

Regarding claim 1, Simon does not provide what Leibowitz lacks. Simon teaches an edge attachment surface in an overflow-downdraw process for the downwardly flowing glass while thinning edge portions. As amended, claim 1 includes "an overflow device on the trough that allows at least some of the molten glass within the trough **to overflow a top of a far end of the trough without flowing over the downwardly sloping sides of the wedged shaped sheet forming structure**" (emphasis added). Simon does not teach or suggest this aspect of the claim. Instead, "molten glass 17 is fed into the channel 11.... A pair of restricting dams 19 are provided above the overflow lips 13 adjacent each end of the channel 11 to direct the overflow of the free surface 20 of the molten glass 17 over the overflow lips 13 as separate streams, and down the opposed forming surface portions 14, 15 to the apex 16...." (Simon, col. 2, lines 61-69). The molten glass in Simon specifically flows down the opposed forming surface portions 14, 15. Simon does not teach or suggest at least some of the molten glass within the trough to overflow a top of a far end of the trough without flowing over the downwardly sloping sides. Since neither Leibowitz or Simon, alone or in combination, teach or suggest amended claim 1, amended claim 1 is not obvious over these two references.

Dependent claim 3, being dependent upon and further limiting independent claim 1, should also be allowable for that reason, as well as for the additional recitations it contains. Applicant respectfully requests reconsideration of the rejection of claim 3, in view of the above amendments and remarks.

19. Claim 4 was rejected under 35 U.S.C. 103(a) as being unpatentable over Leibowitz in view of Overman. Applicant respectfully disagrees. The argument above regarding the anticipation of claim 1 by Leibowitz is incorporated by reference here.

Regarding claim 1, Overman does not provide what Leibowitz lacks. Overman teaches an apparatus for improving thickness uniformity using heater coils 30. As amended, claim 1 includes "an overflow device on the trough that allows at least some of the molten glass within the trough **to overflow a top of a far end of the trough without flowing over the downwardly sloping sides of the wedged shaped sheet forming structure**" (emphasis added). Overman does not teach or suggest this aspect of the claim. Instead, the downdraw sheet glass forming apparatus the heating coils are used with in Overman have "molten glass 46 flowing along opposite sides thereof" (Overman, col. 4, lines 18-19). The molten glass in Overman specifically flows down the sides. Overman does not teach or suggest at least some of the molten glass within the trough to overflow a top of a far end of the trough without flowing over the downwardly sloping sides. Since neither Leibowitz or Overman, alone or in combination, teach or suggest amended claim 1, amended claim 1 is not obvious over these two references.

Dependent claim 4, being dependent upon and further limiting independent claim 1, should also be allowable for that reason, as well as for the additional recitations it contains. Applicant respectfully requests reconsideration of the rejection of claim 4, in view of the above amendments and remarks.

21. Claim 6 was rejected under 35 U.S.C. 103(a) as being unpatentable over Aoki in view of Overman. Applicant respectfully disagrees. The argument regarding the anticipation of claim 5 over Aoki is herein incorporated by reference.

Regarding claim 5, upon which claim 6 depends, Overman does not provide what Aoki lacks. As amended, the apparatus of claim 5 includes "substantially curved top sides of the trough, wherein a substantial portion of said curved top sides has a convex upward shape, such that a substantially uniform thickness glass sheet is formed when glass flows into the trough and over the sides of the trough." Overman does not teach or suggest a trough with substantially curved top sides. Therefore, since neither reference teaches or suggests the elements of claim 5, claim 5 is not obvious over these references.

Dependent claim 6, being dependent upon and further limiting independent claim 5, should also be allowable for that reason, as well as for the additional recitations it contains.

Applicant respectfully requests reconsideration of the rejection of claim 6, in view of the above amendments and remarks.

22. Claim 7 was rejected under 35 U.S.C. 103(a) as being unpatentable over Aoki in view of Simon. Applicant respectfully disagrees. The argument regarding the anticipation of claim 5 over Aoki is herein incorporated by reference.

Regarding claim 5, upon which claim 7 depends, Simon does not provide what Aoki lacks. As amended, the apparatus of claim 5 includes "substantially curved top sides of the trough, wherein a substantial portion of said curved top sides has a convex upward shape, such that a substantially uniform thickness glass sheet is formed when glass flows into the trough and over the sides of the trough.". Simon does not teach or suggest substantially curved top sides of a trough. Therefore, since neither reference teaches or suggests the elements of claim 5, claim 5 is not obvious over these references.

Dependent claim 7, being dependent upon and further limiting independent claim 5, should also be allowable for that reason, as well as for the additional recitations it contains. Applicant respectfully requests reconsideration of the rejection of claim 7, in view of the above amendments and remarks.

23. Claim 14 was rejected under 35 U.S.C. 103(a) as being unpatentable over Ward in view of Aoki. Applicant respectfully disagrees. The argument above regarding the anticipation of claim 13 by Ward is herein incorporated by reference.

Regarding claim 13, upon which claim 14 depends, Aoki does not provide what Ward lacks. The amended claim includes "an internally mounted flow control plug that can be inserted and adjusted within the trough to change at least one flow characteristic of the molten glass within the trough." Neither Ward nor Aoki, alone or in combination, teach or suggest an internally mounted flow control plug as described in claim 13. Therefore, claim 13 is not obvious over Ward and Aoki.

Dependent claim 14, being dependent upon and further limiting independent claim 13, should also be allowable for that reason, as well as for the additional recitations it contains.

Applicant respectfully requests reconsideration of the rejection of claim 14, in view of the above amendments and remarks.

24. Claim 16 was rejected under 35 U.S.C. 103(a) as being unpatentable over Ward in view of Overman. Applicant respectfully disagrees. The argument above regarding the anticipation of claim 13 by Ward is herein incorporated by reference.

Regarding claim 13, upon which claim 16 depends, Overman does not provide what Ward lacks. The amended claim includes "an internally mounted flow control plug that can be inserted and adjusted within the trough to change at least one flow characteristic of the molten glass within the trough." Neither Ward nor Overman, alone or in combination, teach or suggest an internally mounted flow control plug as described in claim 13. Therefore, claim 13 is not obvious over Ward and Overman.

Dependent claim 16, being dependent upon and further limiting independent claim 13, should also be allowable for that reason, as well as for the additional recitations it contains. Applicant respectfully requests reconsideration of the rejection of claim 16, in view of the above amendments and remarks.

25. Claim 17 was rejected under 35 U.S.C. 103(a) as being unpatentable over Ward in view of Leibowitz. Applicant respectfully disagrees. The argument above regarding the anticipation of claim 13 by Ward is herein incorporated by reference.

Regarding claim 13, upon which claim 17 depends, Leibowitz does not provide what Ward lacks. The amended claim includes "an internally mounted flow control plug that can be inserted and adjusted within the trough to change at least one flow characteristic of the molten glass within the trough." Neither Ward nor Leibowitz, alone or in combination, teach or suggest an internally mounted flow control plug as described in claim 13. Therefore, claim 13 is not obvious over Ward and Leibowitz.

Dependent claim 17, being dependent upon and further limiting independent claim 13, should also be allowable for that reason, as well as for the additional recitations it contains. Applicant respectfully requests reconsideration of the rejection of claim 17, in view of the above amendments and remarks.

27. Claims 22 and 39 were rejected under 35 U.S.C. 103(a) as being unpatentable over Corning in view of Ward. Applicant respectfully disagrees. The arguments above regarding the anticipation of claims 20 and 37 are herein incorporated by reference.

Regarding claim 20, upon which claim 22 depends, Ward does not provide what Corning lacks. Claim 20 includes, in part, "c) an orifice running along the top of the trough such that as molten glass is conveyed to the trough the molten glass exits through the orifice and passes down the sides of the trough". Ward does not teach or suggest an orifice. Therefore, claim 20 is not obvious over Corning and Ward.

Dependent claim 22, being dependent upon and further limiting independent claim 20, should also be allowable for that reason, as well as for the additional recitations it contains. Applicant respectfully requests reconsideration of the rejection of claim 22, in view of the above amendments and remarks.

Regarding claim 37, upon which claim 39 depends, Ward does not provide what Corning lacks. Claim 37 includes, in part, the steps of "b) providing an orifice running along the top of the trough; [and] d) conveying molten glass under pressure through the inflow pipe into the trough such that the molten glass exits through the orifice and flows down the sides of the trough and the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge and forms a glass sheet of substantially uniform thickness." Ward neither teaches nor suggests an orifice. Therefore, claim 37 is not obvious over Corning and Ward, alone or in combination.

Dependent claim 39, being dependent upon and further limiting independent claim 37, should also be allowable for that reason, as well as for the additional recitations it contains. Applicant respectfully requests reconsideration of the rejection of claim 39, in view of the above amendments and remarks.

28. Claims 23 and 41 were rejected under 35 U.S.C. 103(a) as being unpatentable over Corning in view of Simon. Applicant respectfully disagrees. Claim 41 has been cancelled. The arguments above regarding the anticipation of claim 20 is herein incorporated by reference.

Regarding claim 20, upon which claim 23 depends, Simon does not provide what Corning lacks. Claim 20 includes, in part, "c) an orifice running along the top of the trough such that as molten glass is conveyed to the trough the molten glass exits through the orifice and passes down the sides of the trough". Simon does not teach or suggest an orifice. Therefore, claim 20 is not obvious over Corning and Simon.

Dependent claim 23, being dependent upon and further limiting independent claim 20, should also be allowable for that reason, as well as for the additional recitations it contains. Applicant respectfully requests reconsideration of the rejection of claim 23, in view of the above amendments and remarks.

29. Claims 25 and 42 were rejected under 35 U.S.C. 103(a) as being unpatentable over Corning in view of Overman. Applicant respectfully disagrees. The arguments above regarding the anticipation of claims 20 and 37 are herein incorporated by reference.

Regarding claim 20, upon which claim 25 depends, Overman does not provide what Corning lacks. Claim 20 includes, in part, "c) an orifice running along the top of the trough such that as molten glass is conveyed to the trough the molten glass exits through the orifice and passes down the sides of the trough". Overman does not teach or suggest an orifice. Therefore, claim 20 is not obvious over Corning and Overman.

Dependent claim 25, being dependent upon and further limiting independent claim 20, should also be allowable for that reason, as well as for the additional recitations it contains. Applicant respectfully requests reconsideration of the rejection of claim 25, in view of the above amendments and remarks.

Regarding claim 37, upon which claim 42 depends, Overman does not provide what Corning lacks. Claim 37 includes, in part, the steps of "b) providing an orifice running along the top of the trough; [and] d) conveying molten glass under pressure through the inflow pipe into the trough such that the molten glass exits through the orifice and flows down the sides of the trough and the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge and forms a glass sheet of substantially uniform thickness."

Overman neither teaches nor suggests an orifice. Therefore, claim 37 is not obvious over Corning and Overman, alone or in combination.

Dependent claim 42, being dependent upon and further limiting independent claim 37, should also be allowable for that reason, as well as for the additional recitations it contains. Applicant respectfully requests reconsideration of the rejection of claim 42, in view of the above amendments and remarks.

30. Claims 26 and 43 were rejected under 35 U.S.C. 103(a) as being unpatentable over Corning in view of Nobbe (US 1731260). Applicant respectfully disagrees. The arguments above regarding the anticipation of claims 20 and 37 are herein incorporated by reference.

Regarding claim 20, upon which claim 26 depends, Nobbe does not provide what Corning lacks. Nobbe teaches a method of forming sheet glass, which consists of the steps of creating two downwardly flowing streams of molten glass, maintaining the body portions of those streams free from contact with mechanical means during the major portion of their travel, uniting the streams, and continuing movement in the form of a single sheet. (Nobbe, claim 1).

In contrast, claim 20 of the present invention includes, in part, "c) an orifice running along the top of the trough such that as molten glass is conveyed to the trough the molten glass exits through the orifice and passes down the sides of the trough". Nobbe does not teach or suggest an orifice. Therefore, claim 20 is not obvious over Corning and Nobbe.

Dependent claim 26, being dependent upon and further limiting independent claim 20, should also be allowable for that reason, as well as for the additional recitations it contains. Applicant respectfully requests reconsideration of the rejection of claim 26, in view of the above amendments and remarks.

Regarding claim 37, upon which claim 43 depends, Nobbe does not provide what Corning lacks. Claim 37 includes, in part, the steps of "b) providing an orifice running along the top of the trough; [and] d) conveying molten glass under pressure through the inflow pipe into the trough such that the molten glass exits through the orifice and flows down the sides of the trough and the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge and forms a glass sheet of substantially uniform thickness."

Nobbe neither teaches nor suggests an orifice running along the top of the trough. Therefore, claim 37 is not obvious over Corning and Nobbe, alone or in combination.

Dependent claim 43, being dependent upon and further limiting independent claim 37, should also be allowable for that reason, as well as for the additional recitations it contains. Applicant respectfully requests reconsideration of the rejection of claim 43, in view of the above amendments and remarks.

Regarding new claim 51, the claim includes "an orifice in the bottom of the trough that allows molten glass to flow to the bottom of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus **and virgin glass forms an outside surface of the glass sheet.**" The claim is fully supported by claim 26, as filed, as well as the specification. "The key feature of the overflow process is that the glass moves through the glass forming equipment and the untouched, "virgin glass", overflows and becomes the outside surface of the glass." (present application, page 1, lines 10-12).

The Nobbe apparatus was patented before the discovery of the "overflow process". Consequently, virgin glass does not form the outside surface of the glass in Nobbe. Therefore, new claim 51 is not anticipated or obvious over Nobbe.

32. Claim 28 was rejected under 35 U.S.C. 103(a) as being unpatentable over Corning in view of Aoki. Applicant respectfully disagrees. The argument above regarding the anticipation of claim 20 is herein incorporated by reference.

Regarding claim 20, upon which claim 28 depends, Aoki does not provide what Corning lacks. Claim 20 of the present invention includes, in part, "c) an orifice running along the top of the trough such that as molten glass is conveyed to the trough the molten glass exits through the orifice and passes down the sides of the trough". Aoki does not teach or suggest an orifice. Therefore, claim 20 is not obvious over Corning and Aoki.

Dependent claim 28, being dependent upon and further limiting independent claim 20, should also be allowable for that reason, as well as for the additional recitations it contains.

Applicant respectfully requests reconsideration of the rejection of claim 28, in view of the above amendments and remarks.

33. Claims 29 and 45 were rejected under 35 U.S.C. 103(a) as being unpatentable over Corning in view of Ferngren (US 1829639). Applicant respectfully disagrees. The arguments above regarding the anticipation of claims 20 and 37 are herein incorporated by reference.

Regarding claim 20, upon which claim 29 depends, Ferngren does not provide what Corning lacks. Ferngren teaches a method and apparatus for drawing sheet glass. The method consists of the steps of flowing a plurality of separated streams of molten glass, of less width but greater thickness than the sheet, downwardly in contact with supporting surfaces, flowing a pair of streams of molten glass downwardly around the separated streams, and uniting all of the streams to form a source from which the glass sheet is drawn.

In contrast, claim 20 of the present invention includes, in part, "c) an orifice running along the top of the trough such that as molten glass is conveyed to the trough the molten glass exits through the orifice and passes down the sides of the trough". Ferngren does not teach or suggest an orifice running along the top of the trough. Therefore, claim 20 is not obvious over Corning and Ferngren.

Dependent claim 29, being dependent upon and further limiting independent claim 20, should also be allowable for that reason, as well as for the additional recitations it contains. Applicant respectfully requests reconsideration of the rejection of claim 29, in view of the above amendments and remarks.

Regarding claim 37, upon which claim 45 depends, Ferngren does not provide what Corning lacks. Claim 37 includes, in part, the steps of "b) providing an orifice running along the top of the trough; [and] d) conveying molten glass under pressure through the inflow pipe into the trough such that the molten glass exits through the orifice and flows down the sides of the trough and the downwardly sloping sides of the wedged shaped sheet forming structure and meets at the bottom of the wedge and forms a glass sheet of substantially uniform thickness."

Ferngren neither teaches nor suggests an orifice. Therefore, claim 37 is not obvious over Corning and Ferngren, alone or in combination.

Dependent claim 45, being dependent upon and further limiting independent claim 37, should also be allowable for that reason, as well as for the additional recitations it contains. Applicant respectfully requests reconsideration of the rejection of claim 45, in view of the above amendments and remarks.

Regarding new claim 53, the claim includes "two orifices in the side of the trough that allows molten glass to flow to the downwardly sloped sides of the wedge shaped forming apparatus such that molten glass is added to the middle of the glass sheet being formed by the molten glass flowing down the downwardly sloped sides of the wedge shaped forming apparatus **and virgin glass forms an outside surface of the glass sheet**". No new matter has been added. The claim is fully supported by claim 29, as filed, as well as the specification. "The key feature of the overflow process is that the glass moves through the glass forming equipment and the untouched, "virgin glass", overflows and becomes the outside surface of the glass." (present application, page 1, lines 10-12).

The Ferngren apparatus was patented before the discovery of the "overflow process". Consequently, virgin glass does not form the outside surface of the glass in Ferngren. Therefore, new claim 53 is not anticipated or obvious over Ferngren.

35. Claim 31 was rejected under 35 U.S.C. 103(a) as being unpatentable over Corning and Ward as applied to claim 22 above, and further in view of Overman. Applicant respectfully disagrees. The arguments above regarding the anticipation and obviousness of claims 20 and 22 are herein incorporated by reference.

Regarding claim 20, upon which claim 31 depends, Overman does not provide what Corning and Ward lack. Claim 20 of the present invention includes, in part, "c) an orifice running along the top of the trough such that as molten glass is conveyed to the trough the molten glass exits through the orifice and passes down the sides of the trough". Overman does not teach or suggest an orifice. Therefore, claim 20 is not obvious over Corning, Ward, or Overman, alone or in combination.

Dependent claim 31, being dependent upon and further limiting independent claim 20 and dependent claim 22, should also be allowable for that reason, as well as for the additional recitations it contains. Applicant respectfully requests reconsideration of the rejection of claim 31, in view of the above amendments and remarks.

Allowable Subject Matter

37. The Examiner stated that Claims 8-12 and 35 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action. Such amendments have been made, and claims 8-12 and 35 should now be in condition for allowance. Applicant respectfully request that the Examiner allow claims 8-12 and 35.

38. Claims 18, 21 24, 27, 30, 33, 38, 44 and 46 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Independent claims 13, 20, 32, and 37, upon which these claims depend, should now be allowable. In addition, new claims 58-67 are dependent off of allowable claim 21, and should also be allowable. New claims 73-80 are dependent off of allowable claim 38, and should also be allowable.

Dependent claims 18, 21, 24, 27, 30, 33, 38, 44 and 46, being dependent upon and further limiting independent claims 13, 20, 32, and 37, should also be allowable for that reason, as well as for the additional recitations they contain. Reconsideration and withdrawal of the objection to claims 18, 21, 24, 27, 30, 33, 38, 44 and 46 is respectfully requested.

Conclusion

Applicant believes the claims, as amended, are patentable over the prior art, and that this case is now in condition for allowance of all claims therein. Such action is thus respectfully requested. If the Examiner disagrees, or believes for any other reason that direct contact with Applicants' attorney would advance the prosecution of the case to finality, he is invited to telephone the undersigned at the number given below.

"Recognizing that Internet communications are not secured, I hereby authorize the PTO to communicate with me concerning any subject matter of this application by electronic mail. I understand that a copy of these communications will be made of record in the application file."

Respectfully Submitted:
Richard B. Pitbladdo

By: _____
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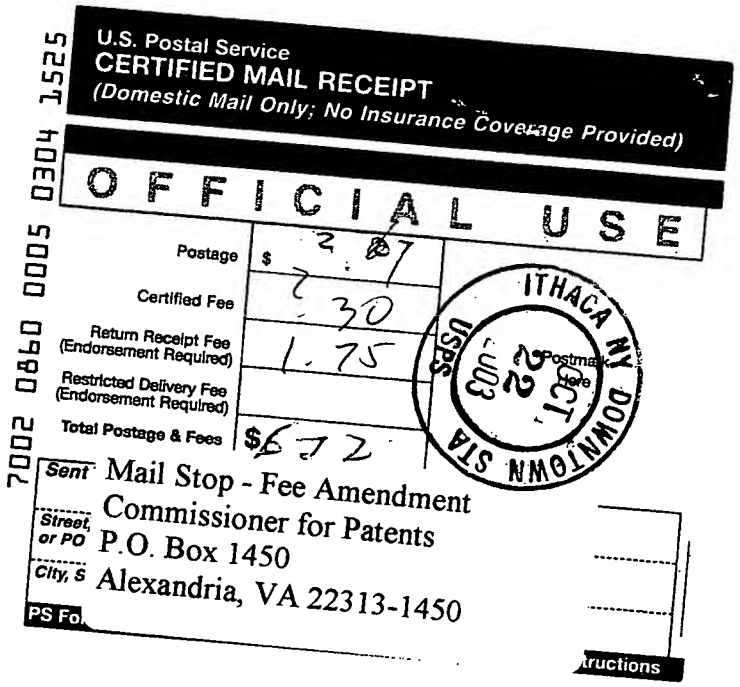

Docket No. PIT-1 Serial/Patent No. 09/851,627
Title: Sheet Glass Forming Apparatus
Inventor/s: Richard B. Pitbladdo
The following, due _____ in the USPTO was received in the Patent Office Mail Room on the date stamped hereon:

- ☑ Transmittal
- ☐ Fee Transmittal
- ☐ Specification
- ☑ Drawings
- ☐ Declaration/POA
- ☐ Assignment/Cover
- ☐ Sequence List & Disk
- ☐ Stmt. Under 37 CFR § 1.821
- ☐ PTO Data Sheet(s)
- ☐ Provisional Patent Appl. & Cover
- ☐ Check #09974 $ 129.00

Mailed 10/22/03

- ☐ RCE Transmittal Form
- ☐ Notice of Appeal
- ☐ Appeal Brief
- ☐ Petition/Request for _____
- ☐ IDS ☐ _____ References
- ☐ Issue Fee & Transmittal
- ☑ Response to Office Action
- ☐ Missing Parts Form & Fee
- ☐ Preliminary Amendment
- ☐ Maintenance Fee & Transmittal
- ☐ Other: _____

By: _____

7002 0860 0005 0304 1525

PTO/SB/21 (08-03)
Approved for use through 08/30/2003. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	09/851,627
Filing Date	May 9, 2001
First Named Inventor	Richard B. Pitbladdo
Art Unit	1731
Examiner Name	Vincent, Sean E
Attorney Docket Number	PIT-1

Total Number of Pages in This Submission

ENCLOSURES *(Check all that apply)*

- [x] Fee Transmittal Form
- [x] Fee Attached
- [x] Amendment/Reply
- [ ] After Final
- [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Response to Missing Parts/ Incomplete Application
- [ ] Response to Missing Parts under 37 CFR 1.52 or 1.53
- [x] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert to a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s) _____
- [ ] After Allowance communication to Technology Center (TC)
- [ ] Appeal Communication to Board of Appeals and Interferences
- [ ] Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- [ ] Proprietary Information
- [ ] Status Letter
- [x] Other Enclosure(s) (please Identify below):

PostCard

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Brown & Michaels, PC
Signature	Reg. No. 45,617
Date	10/22/03

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below.

Typed or printed name	Justin Wood		
Signature		Date	

PTO/SB/17 (10-03)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

FEE TRANSMITTAL for FY 2004

Effective 10/01/2003. Patent fees are subject to annual revision.

☑ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 429.00

Complete if Known	
Application Number	09/851,627
Filing Date	May 9, 2001
First Named Inventor	Richard B. Pitbladdo
Examiner Name	Vincent, Sean E
Art Unit	1731
Attorney Docket No.	PIT-1

METHOD OF PAYMENT *(check all that apply)*

☑ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☑ Deposit Account:

Deposit Account Number: 02-0910

Deposit Account Name: Brown & Michaels, PC

The Director is authorized to: *(check all that apply)*

☐ Charge fee(s) indicated below ☑ Credit any overpayments

☑ Charge any additional fee(s) or any underpayment of fee(s)

☐ Charge fee(s) indicated below, **except for the filing fee** to the above-identified deposit account.

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	770	2001	385	Utility filing fee	
1002	340	2002	170	Design filing fee	
1003	530	2003	265	Plant filing fee	
1004	770	2004	385	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($) 0.00

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

	Extra Claims		Fee from below	= Fee Paid
Total Claims	-20** = 32	X	9.00	= 288.00
Independent Claims	- 3** = 2	X	43.00	= 86.00
Multiple Dependent				=

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	86	2201	43	Independent claims in excess of 3
1203	290	2203	145	Multiple dependent claim, if not paid
1204	86	2204	43	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 374.00

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	55.00
1252	420	2252	210	Extension for reply within second month	
1253	950	2253	475	Extension for reply within third month	
1254	1,480	2254	740	Extension for reply within fourth month	
1255	2,010	2255	1,005	Extension for reply within fifth month	
1401	330	2401	165	Notice of Appeal	
1402	330	2402	165	Filing a brief in support of an appeal	
1403	290	2403	145	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,330	2453	665	Petition to revive - unintentional	
1501	1,330	2501	665	Utility issue fee (or reissue)	
1502	480	2502	240	Design issue fee	
1503	640	2503	320	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	770	2809	385	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	770	2810	385	For each additional invention to be examined (37 CFR 1.129(b))	
1801	770	2801	385	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 55.00

SUBMITTED BY

Name (Print/Type)	Meghan Van Leeuwen	Registration No. (Attorney/Agent)	45,612	Telephone	(607) 256-2000
Signature	Meghan Van Leeuwen			Date	10/22/03

(Complete *(if applicable)*)

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No.	09/851,627
Applicant:	Richard B. Pitbladdo
Filed:	May 9, 2001
Title:	Sheet Glass Forming Apparatus
Art Unit:	1731
Examiner:	Vincent, Sean E
Confirmation Number:	4080
Attorney Docket No.:	PIT-1

Commissioner of Patents
PO Box 1450
Alexandria VA 22313

PETITION FOR EXTENSION OF TIME TO FILE RESPONSE ACCOMPANIED BY FEE

The applicant herewith petitions the Commissioner of Patents and Trademarks to extend the time to respond to the Office Action dated June 23, 2003, for one month, from September 23, 2003 to October 23, 2003.

A check in the amount of $55.00 is attached for payment of extension fee.

The Commissioner is hereby authorized to charge any additional fees that may be required, or credit any overpayment to Deposit Account No. 02-0910. **A duplicate of this transmittal is attached.**

Respectfully submitted:

Date: 10/22/03

Meghan Van Leeuwen, Registration No. 45,612
BROWN & MICHAELS, PC
400 M&T Bank Building, 118 N. Tioga Street
Ithaca, New York 14850-4343
Voice: (607) 256-2000 Fax: (607) 256-3628

CERTIFICATE OF CERTIFIED MAILING

CERTIFIED MAIL NO: 7002 0860 0005 0304 1525 **DATE: October 22, 2003**

I hereby certify that this paper is being deposited with the U.S. Postal Service as Certified Mail with return receipt requested on the date indicated above and is addressed to Commissioner for Patents, Alexandria, VA 22313-1450.

Justin Wood